

Observations on the Mackerel Fishery of the Netravati Estuary, West Coast, South India¹

BY

P. C. GEORGE, M. H. DHULKHED, AND V. RAMAMOHANA RAO
Central Marine Fisheries Research Unit, Mangalore-1

(With three text-figures)

INTRODUCTION

The present communication relates to observations on an unusual fishery of the Indian Mackerel *Rastrelliger kanagurta* (Cuvier) in the Netravati estuary near Mangalore, lasting for about nine weeks from the latter half of January 1958. Normally the mackerel fishery is most active along the Konkan, Kanara, and Kerala coasts during the September-March period, and the catches comprise mostly immature forms ranging from 180-215 mm. in total length. There are no previous records of mackerel fishery of any appreciable extent from our estuaries, although Pradhan (1956) has recorded the fish entering the estuarine waters of the Kali River at Karwar, ascending along the tidal current up to a distance of $1\frac{1}{2}$ miles during April and May when the range of salinity of the river is between 29.73‰ and 34.6‰ .

The estuary at Mangalore is formed by the confluence of two rivers, the Gurpur River from the north and the Buntwal or Netravati River from the south, and is situated a few furlongs south of Mangalore town. The Gurpur River is comparatively narrower and more shallow. The active zone of the usual estuarine fishery in the Netravati River is limited to the area in between the Ullal bridge and the river mouth. The estuary is rich and supports an active fishery almost throughout the year. During the monsoon months the catches are mostly *Etroplus suratensis*, *Mugil* spp., *Gerres filamentosus*, *Sillago* spp., *Platycephalus* spp., and many species of cat fishes. In the post-monsoon months, with increased salinity and other favourable conditions, more and more marine species enter the estuary and

¹ Published with the kind permission of the Chief Research Officer, Central Marine Fisheries Research Station, Mandapam.

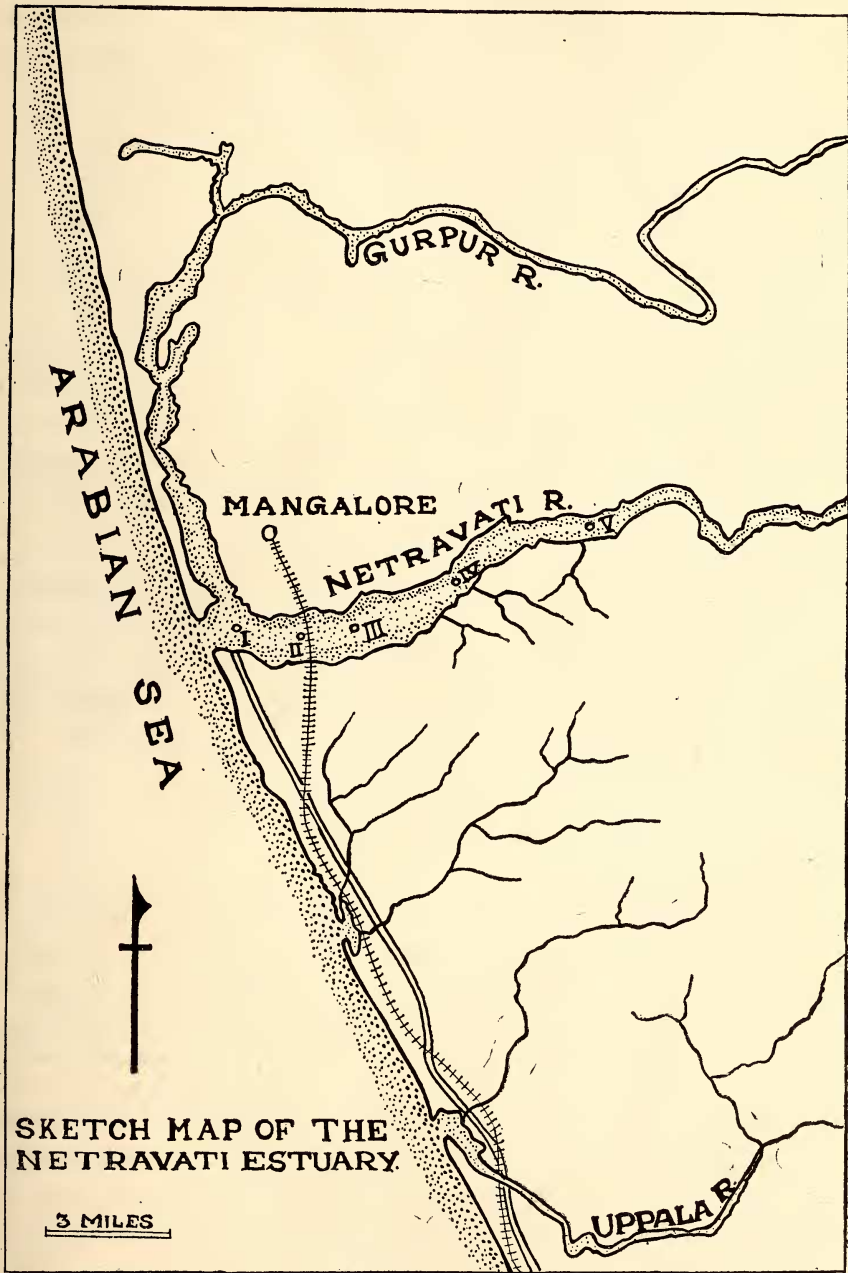


Fig. 1. Map adapted from Admiralty chart No. 746 showing the Netravati estuary and observation centres.

by early January the usual fishery is supplemented to some extent by the occurrence in smaller numbers of *Hilsa kanagurta*, *Sardinella fimbriata*, *Belone* spp., smaller carangids, prawns, and crabs. Shore-seines commonly called 'kai-rampani' and cast nets operated from canoes are the more common gear in use in the estuary. Beyond the bridge area, the fishing is generally done only for pearl-spots, mullets, 'cat fishes, and clams and it is in this and in the upper and interior centres (Fig. 1) that the mackerel shoals were noticed.

During the estuarine mackerel fishery season, the river was never deeper than two fathoms. The fishery extended up to Pavur, a village about six miles from the river mouth (St. V in Fig. 1), but never beyond. Five stations were selected in the estuary to study the salinity influence and related conditions in the river, with the river mouth marked as station I, Ullal bridge (a distance of one mile) as station II, Adamkuduru as station III (a distance of three miles from estuary), Perivala (a distance of $4\frac{1}{2}$ miles from river mouth) as station IV, and Pavur as the last station. The fishery at the river mouth up to station II near Ullal bridge was of the mixed type, including smaller numbers of mackerel. The catches except that of mackerel were poor at stations III, IV, and V. It is apparent that the shoals moving with the ebb tide in the first few hours after dusk contributed to the catches in the upper centres in the small hours of the morning. During this period no oil sardines (*Sardinella longiceps*) of any size were caught at any of the centres in the estuary, although their fishery was fairly active in the adjacent inshore seas during the period.

THE MACKEREL FISHERY

The mackerel catches from the estuary were first noticed on 26 January when about four baskets of large-sized mackerel were found kept along with the estuarine catches in the fish market. On enquiry it was found that mackerel started appearing in the river catches in small numbers on 25 January. Field enquiries showed that fishermen from Bolar and neighbouring centres, anticipating good catches of fish based on the stray records of previous days, were making preparations to carry out regular night-fishing for mackerel in the estuary and in the sea. The goodwill of the local fishermen was made use of to conduct on-the-spot studies from the different areas of the estuary while they were carrying out fishing from midnight into the early hours of the morning. The fishery continued actively for about seven weeks bringing in an average of about two hundred mackerel each day.

About eight thousand mackerel were brought to the Mangalore main market alone from the estuary during this season. The mackerel catches from the sea of Mangalore during this period comprised purely small specimens with appreciable difference in size and maturity, as can be seen from Fig. 2. A similar phenomenon of

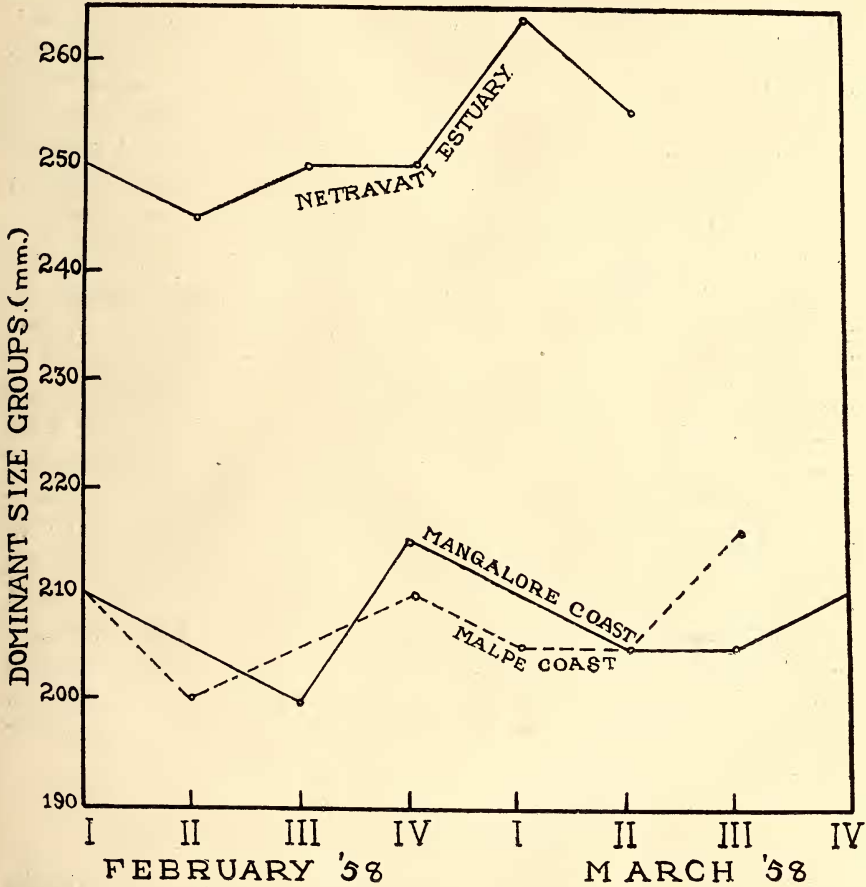


Fig. 2. Graph showing the distribution of the dominant size groups of mackerel in the Netravati estuary, Malpe and Mangalore coasts during the estuarine mackerel fishery season.

mackerel ascending the estuary was observed in the latter half of February in the Chandragiri River also at Kasargod, about thirty miles south of Mangalore. The fishery, unlike that at Netravati, was of short duration and the catches of smaller magnitude. But as regards dominant sizes, maturity conditions, hydrological and related ecological factors, they were quite comparable with the conditions observed at Mangalore. The mackerel obtained from the estuary

were considered by the fishermen to be quite distinct from those caught in the open sea during this time of the year, due to their conspicuously large size, heaviness, and high palatability on account of the increased fat content.

Size Groups: The estuarine catches were comprised almost entirely of adult-sized specimens. The smallest size recorded from the catches was 210 mm. of a stray specimen and the largest 273 mm. (total length). The dominant size of the fishery was 240-250 mm. size. The gear was not selective to include only the largest ones, since the other fishes caught along with the mackerel were of much smaller size. The size range of specimens stood in great contrast to that of the catches from the open coast centres of this zone from Malpe to Kasargod, where only medium-sized specimens with a dominant size range of 180-215 mm. alone were obtained (Fig. 2).

Maturity Conditions: The large estuarine mackerel revealed gonadal conditions of partially spent, spent, and also recovering stages. The presence of small gonads with a body length up to 273 mm. along with other characters indicates the possibility that these belong to a subsequent spawning generation. The testes were found to be much reduced in size, quite flabby and bloodshot, and also indicated spent conditions. The partially spent testes on teasing released sperms which under an oil immersion lens were found to be motile. It was noted that the spent testes, although collapsed and shrunk, still retained motile sperms. The scales also revealed growth checks comparable to the ones observed from the large mackerel obtained from the sea during the monsoon season. Thus the studies tend to show that these very large specimens that enter the estuaries belong to a distinct age group, different from the main catches along the coast.

PLANKTOLOGICAL AND HYDROLOGICAL CONDITIONS

Water samples were collected from all the five centres of the estuary during the fishery season, both during ebb tide and also during low tide. The zone of active mackerel fishery was between stations II and III and the range in subsurface salinity was 14.10 ‰ to 23.50 ‰. The highest subsurface salinity noted at Station V during the season when stray specimens were collected was only 6.79 ‰. The depths at all the centres were never more than two fathoms, and no difference was noted in the salinity values of the surface and bottom samples in the different centres. The planktonological conditions revealed a dominance of marine conditions up to station II and slightly beyond. The significant difference from the

marine plankton of the corresponding weeks was the predominance of the copepod *Isias tropica*, and scarcity of diatoms in the estuarine samples.

FOOD AND FEEDING

The food and feeding conditions of mackerel collected from the estuary were analysed and studied to find out whether there was any significant variation in the nutrition of the fishes from the different habitats and from the observations made earlier from this coast (Bhimachar and George, 1952). The studies showed that the predominance of the respective 'edible' elements in the marine and

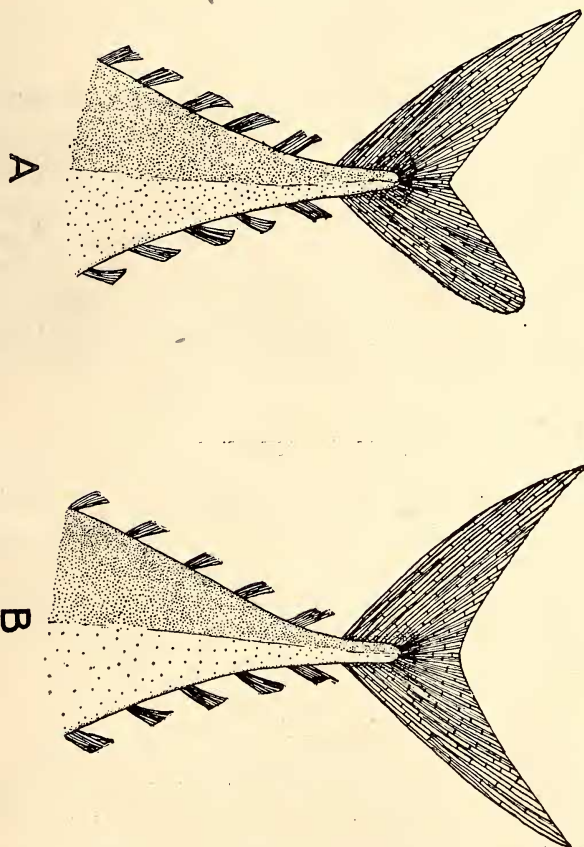


Fig. 3. Semi-diagrammatic sketches showing sub-equal and normal caudal fin lobes. A.—Sub-equal lobes. B.—Normal lobes.

riverine stations were more or less proportionately reflected in the gut-elements, and that estuarine specimens showed active feeding during their movement up the estuary.

ABNORMAL CAUDAL FIN LOBES

An unusually large number of specimens were found to have sub-equal caudal fins, the lower lobe being the shorter (Fig. 3). It is quite likely that this condition may have been formed by mutilation at an earlier stage of life, or due to pathological conditions or even to some genetic factor. In any case, it is interesting that only one lobe should be affected. The possibility suggested by local fisher folk that the lower caudal fin lobe might have been smoothly rounded off during the sojourn up due to constant friction with the sandy bottom would appear erroneous, as fin margins were not frayed nor did they show any trace of wear and tear.

CONCLUSION

The presence of an active and continuous mackerel fishery in the estuary indicates the capacity of the shoals to withstand lower salinity conditions. The fishery is interesting in that it is supported mostly by a larger size group distinctly different from that of the catches from the open coast centres. The occurrence of partially spent and recovering stages in very large numbers during this season indicates the possibility of a longer or subsidiary spawning season for the fish along this coast. The large incidence of sub-equal caudal fin lobes in the estuarine specimens also adds to the general interest.

ACKNOWLEDGEMENT

The authors are grateful to Dr. S. Jones, Chief Research Officer, for his interest in the investigations, and for valuable suggestions in the preparation of this account. The helpful comments made by colleagues on the fish material exhibited at the meeting of mackerel and sardine workers at Ernakulam during March 1958 are also acknowledged.

REFERENCES

- Bhimachar, B.S., and George, P.C. (1952): Observations on the food and feeding of the Indian Mackerel, *Rastrelliger kanagurta* (Cuvier). *Proc. Indian Acad. Sci.* 36 (3): 105-118.
- Pradhan, L.B. (1956): Mackerel fishery of Karwar *Ind. Jour. Fish.* 3 (1): 141-185.